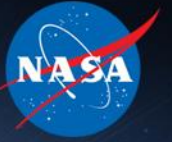


National Aeronautics and Space Administration



<https://www.nasa.gov/solve/marsbalancechallenge>

MARS

Balance
MASS
Challenge



James E. Johnson
October 29, 2015

www.nasa.gov

Open Innovation Summit – October 28-29, 2015, Boston, MA
Best Practices and Lessons Learned



Image obtained from: <https://www.flickr.com/photos/travelcedric/255748676/>

Open Innovation Summit
(10/29/15)

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Mars Balance Mass InnoCentive Challenge

Goal: *To solicit innovative concepts for using Mars Science Laboratory heritage Balance Mass for achieving science and/or technological objectives*

- 300 kg of Balance Masses flown on MSL to assist spacecraft orientation
 - Two 75kg Cruise Balance Masses
 - Six 25kg Entry Balance Masses
- Masses made of solid tungsten
- Sought detailed design concepts to replace/integrate with one or more Balance Mass Devices (BMDs)
- Supported through NASA's Center of Excellence for Collaborative Innovation (COECI)
- Challenge run via InnoCentive
- \$20,000 initial prize purse

Open Innovation Summit
(10/29/15)

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Collaborative Innovation = Significant Participation!



2108

Registered
Solvers

219

Submissions

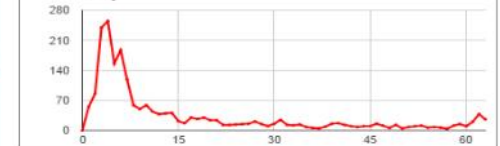
95

Participating
Countries

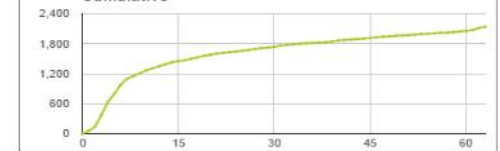
Solvers



Daily



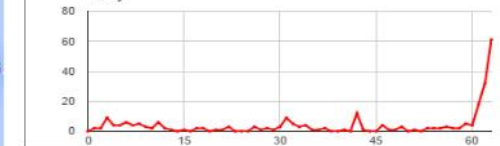
Cumulative



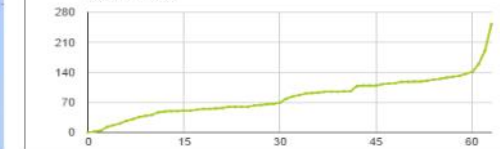
Solutions



Daily



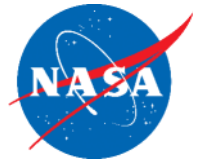
Cumulative



Region	Sum of Project Rooms	Sum of Solutions
Africa/Mid-East	65	6
Asia Pacific	103	18
E. Europe/Russia	148	16
North America	1001	104
South Asia	452	43
South/Central America	52	6
W. Europe & Nordic	287	31
Grand Total	2108	224

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Our Evaluation Process



- Culling of submissions yielded 93 submissions worthy of detailed review
 - ~40% of total submissions
- Assembled 16 person Agency-wide review team
 - 4 week review period
- Submission review utilized an Excel rubric with Likert scale evaluation of:
 - Judging Criteria
 - Project Criteria
 - Technical Requirements
- “Top 10” identified by submission ranking in relation to each of the evaluation area as well as an average rating

General Info		Judging Criteria			Project Criteria										Technical Requirements										Miscellaneous									
General identifying/rating information.		Likert scale (Below, 5/High), per 3 judging criteria in challenge statement.			11 project criteria as listed in challenge statement. Select yes if the criteria is met (or mostly met), no if it is not met or is incomplete, and N/A if the criteria is not applicable to the proposed concept.										13 technical requirements as listed in challenge statement. Select yes if the requirement is met, no if it is not met or is incomplete data exists, and N/A if the requirement is not applicable to the proposed concept.										Section for miscellaneous details (does not print).									
Challenge Number	Short Description	Score	Creativity	Practicality	Knowledge	#1 GAO Feasible	#2 GAO Feasible	#3 GAO Feasible	#4 GAO Feasible	#5 GAO Feasible	#6 GAO Feasible	#7 Feasibility Prediction	#8 Prototype Plan	#9 Scalability Reference	#10	#11 No identifiable cost	#12 Much BMD	#13 Characterization	#14 Total Mass	#15 Structural Mass	#16 FR Composite Envelope	#17 FR ERMID Envelope	#18 ERMID End Sec'n	#19 Power Sub-Cooling	#20 No MSL M-Rate	#21 Fuel-Landing	#22 Landing	#23 Low Re-Contact Risk	#24 Potential Chewing	#25 Data Plan	#26 Data Return	#27 Cash	#28 Not a Hazard	General Reviewer Notes
001	Multi-Balloon Canister	3	3	2	3	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	N/A	No	No	No	No	No	N/A	No	Too little detail. Interesting concept, but just not developed sufficiently.	
002	Drones	3	2	1	3	No	No	Yes	Yes	Yes	No	No	No	No	No	Yes	No	No	No	N/A	No	Yes	Yes	No	No	No	No	No	N/A	No	Interest concept although drone use is not novel. Good dimensioning, but no mass allocation.			
003	Astronaut Tools	3	5	2	1	No	No	Yes	No	N/A	N/A	No	No	No	No	Yes	No	No	No	No	No	No	N/A	Yes	No	Yes	No	N/A	N/A	Yes	Very creative idea, but not developed sufficiently. May incur risk for crew retrieval at a minimal gain.			
004	Mars Radio	3	4	1	1	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	Yes	Too little detail. Does not advance state of scientific knowledge or technology.			
005	Current Generation - N/A	3	1	1	1	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No mention of applicability to balance mass. A unrelated research paper.		
006		3																																
007		3																																
008		3																																
009		3																																
010		3																																
011		3																																
012		3																																
013		3																																
014		3																																
015		3																																
016		3																																
			Creativity																															
			Is the concept novel and not repetitive?																															
			(1=Not novel/Highly Repetitive, 5=Very Novel/Non-Repetitive)																															



MARS

Balance
MASS
Challenge

Winner was Ted
Ground from
Rising Star, Texas
(population 799)

Honorable
Mention team
from Grand
Rapids, Michigan

\$25,000 in prizes awarded!

Winning Submission: Barium tracers for atmospheric analysis

Honorable Mention: Micro-balloon deployment for wind analysis



Lessons Learned in Open Innovation



1. Have a challenge owner
 - Who ‘owns’ the problem?
 - Implementing a solution needs a champion
2. Establish your evaluation criteria before you start
 - Ask “what would a winning submission look like?”
3. Leverage promotion opportunities
 - Identify critical times & opportunities for promoting a challenge
 - Help solvers to fully understand your problem
4. Collect a diverse review team
 - Diverse teams can see unlikely intersections
 - Avoid last minute searches for ‘experts’
5. Give ample time for the review process
 - Avoid holidays!
 - Ensure commitment from your reviewers
6. Make a decision!
 - Quantitative assessment is a tool, but won’t decide for you
 - A small team may be needed for a final selection
7. Have an open innovation strategy
 - Consider future challenges opportunities early